

2024A8

CIRCUITS, CURRENT

Level 1:

Figure 2:

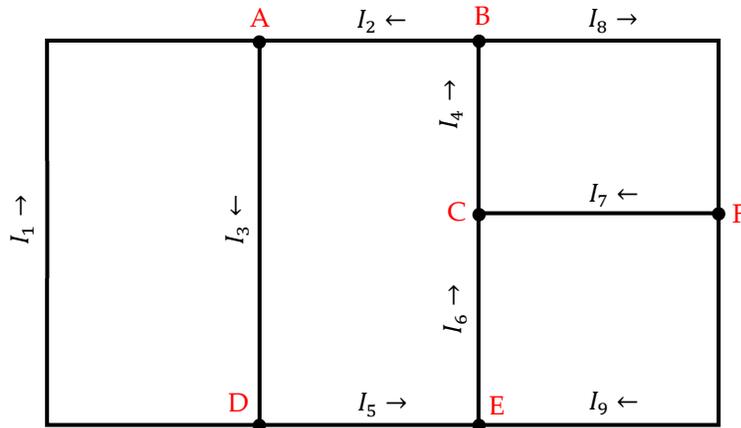
$$\begin{aligned}
 I_{in} &= -I_{out} \\
 I_{in} &= I_3 + I_4 + I_5 \\
 I_{out} &= I_1 + I_2 \\
 I_3 + I_4 + I_5 + I_1 + I_2 &= 0 \\
 I_2 &= I_3 + I_4 + I_5 + I_1 \\
 -I_2 &= (2.7 A) + (1.5 A) + (4.3 A) + (-3.6 A) \\
 I_2 &= -4.9 A
 \end{aligned}$$

Figure 3:

$$\begin{aligned}
 I_{in} &= I_{out} \\
 I_{in} &= I_2 + I_4 \\
 I_{out} &= I_1 + I_3 + I_5 \\
 I_2 + I_4 + I_1 + I_3 + I_5 &= 0 \\
 -I_2 &= I_4 + I_1 + I_3 + I_5 \\
 -I_2 &= (1.5 A) + (-3.6 A) + (-2.7 A) + (-4.3 A) \\
 I_2 &= 9.1 A
 \end{aligned}$$

Level 2:

Figure 4: Lets label the nodes so that it's easier to keep track of our calculations!



Using $I_{in} - I_{out} = 0$, we find the current relationships at each node:

Node A: $I_1 + I_2 - I_3 = 0$

Node B: $I_4 - I_2 - I_8 = 0$

Node C: $I_6 - I_4 + I_7 = 0$

Node D: $I_3 - I_5 - I_1 = 0$

Node E: $I_9 + I_5 - I_6 = 0$

Node F: $-I_7 + I_8 - I_9 = 0$

$$I_1 + I_2 - I_3 = 0$$

$$I_1 = -(0.8 A) + (1.2 A)$$

$$I_1 = 0.4 A$$

$$-I_7 + I_8 - I_9 = 0$$

$$I_7 = (0.9 A) - (0.5 A)$$

$$I_7 = 0.4 A$$

$$I_4 - I_2 - I_8 = 0$$

$$I_8 = (1.7 A) - (0.8 A)$$

$$I_8 = 0.9 A$$

$$I_3 - I_5 - I_1 = 0$$

$$I_5 = (1.2 A) - (0.4 A)$$

$$I_5 = 0.8 A$$

$$I_9 + I_5 - I_6 = 0$$

$$I_6 = (0.5 A) + (0.8 A)$$

$$I_6 = 1.3 A$$